FH-O 100404
SAFEGUARDS OF POTENTIAL NUCLEAR MATERIAL
IN 105-F FUEL STORAGE BASIN
ATTACHMENT 2
Safeguards and Security Plan for
the F Reactor Basin Clean-Out
Consisting of seven pages
including coversheet

SAFEGUARDS AND SECURITY PLAN FOR THE F REACTOR BASIN CLEAN-OUT

Bechtel Hanford, Inc. (BHI) is in the process of cleaning up the F Reactor site. As they clean out the remaining three feet of soil from the old fuel storage basin, there is a possibility that they may come across fragments of fuel that have been left there. This plan describes how these fragments will be identified, protected, and accounted for once they are found.

.0 DESCRIPTION

The F Reactor is located on the Hanford reservation and was one of several plutonium production reactors that were operated during the Cold War era. The fuel pieces that were loaded into the reactor were cylinders 1.44 inches in diameter, with an axial hole, and made in two lengths. The 8.965-inch pieces were manufactured from natural uranium, and the shorter .40-inch pieces were manufactured using uranium enriched to 0.947%. The latter were primarily for use as end pieces in the loading tubes. The reactor basin was filled with soil in early 1970.

.1 Basin Excavating

The fuel storage basin at the F Reactor is located outside the buildings where the first 17 feet of the excavation has been completed. A Brock 330 robot will be used to excavate the final highly contaminated three feet of soil. A gamma camera and a high-resolution isotopic gamma detection will be used to map the basin with the remaining three feet of soil and locate any candidate fragments of fuel. All of the basin fill-dirt is monitored for gamma activity. Soil from the remaining three feet is being sent as low-level waste for disposal. Soil removed from upper levels of the basin is clean enough to allow it to be saved for re-fill.

1.2 Recovering Candidate Fuel

Each hot spot potentially containing fuel fragments will be excavated by the robot. Each bucket load contains one to two cubic feet of soil. When instruments indicate that a load contains fission products, the load will be dumped onto a hard surface (e.g., plywood) where fragments can be dug out. The robotic manipulator device is capable of handling fragments down to 1-inch long by 1 1/2 inches in diameter, which will therefore be the smallest size capable of being retrieved as fuel fragments. The remainder of the scoop will be surveyed and, if no other emitters are indicated, it will be loaded for disposal as low-level waste. Or, if it contains fission products that would indicate fuel fragments, it will be placed into transuranic waste.

1.3 Accumulating Candidate Fuel

A half-height 55-gallon drum of water will be buried at the corner of the basin and covered by a massive (200 to 400 pound) radiation shield. When a candidate piece of fuel is found, digging will be suspended, the lid will be hoisted off, the robot will put the candidate piece into the drum, and the lid will be replaced. Only fragments that are positively identified as fuel will be packaged. This will be done primarily by comparing photon activity of cobalt 60, an activation product, relative to cesium 137, a fission product.

1.4 Packaging Campaign

As candidate pieces are added to the drum, the number of fragments is monitored visually so that when the quantity appears to be approaching 75 pounds, digging will be suspended and a loadout campaign will be initiated. This is planned as a one-day operation. However, fragment transfers **will** be halted if time-estimates indicate the need to do so in order to avoid leaving unsecured containers overnight.

1.5 Packaging Procedure

The shielding lid is hoisted from the buried drum and from the canister provided by K Basins. Each of the fuel fragments are removed from the drum, cleaned, weighed, and placed in the canister. All of this is done by the robot (preferred) or by the crane and long-handled tools. Cleaning is done by flushing the dirt off with water (and blotting dry, if necessary). After the canister is loaded, the lid is replaced and an operator installs the four 0.5-inch bolts that secure the lid. The canister is then put into the shielded cask on the transport truck bed and a Tamper Indicating Device (TID) is applied. The shielded cask is 48 inches in diameter and 56 inches high. The truck remains within the fenced property protection area until K Basins is prepared to accept the material.

2.0 PHYSICAL SECURITY

This section addresses the security measures to be implemented at the decommissioned 100-F Fuel Storage Basin in the event that reportable quantities of Category IV spent nuclear fuel are discovered during soil removal activities.

2.1 Access **Control**

2.1.1 Security Badges

All contractor and sub-contractor personnel shall display security badges in accordance with the Site policies and procedures. Security badges must be worn between the neck and the waist on the outermost garment on the front of the body, at all times, while on the Hanford Site. If precluded by safety considerations (e.g., working over rotating equipment), security badges may be placed inside shirts, coats, or pockets for the duration of hazardous work activities.

Security badge photographs must match the appearance of the bearer and shall not be altered. In the event that a security badge is lost or forgotten, the BHI Construction Manager shall be notified immediately to coordinate obtaining either a one-day temporary or a replacement security badge.

2.1.2 Security Fencing

The basin area is bounded by an eight-foot high NO. 1 1 gauge chain-link industrial security fence. All vehicle and pedestrian ingress/egress gates shall be secured with Security approved padlocks (see section 2.1.4) during off-shift hours or as indicated in this section.

2.1.3 Security Gates

The existing north vehicle gate will be used for transport vehicle access and will only be opened when entry/exit is required. The existing south-facing pedestrian gate, leading into the 108-F Decontamination and Decommissioning (D&D) Area, shall be used only for personnel traffic. The pedestrian gate shall be locked open during day-shift hours and secured during the off-shift. Vehicle Gate 14, located on the east perimeter fence leading from the 108-F D&D Area adjacent to the personnel gate, shall be permanently locked open.

Gates shall be posted with the following signs;

- Authorized Personnel Only
- Security Badges Required
- Prohibited Articles
- Visitor Instructions

Only individuals assigned by BM Construction Management shall be authorized to open and secure gates that provide access to the basin.

2.1.4 SecuftyPadlocks

Security padlocks used on perimeter fence line gates shall be approved by Protection Technology Hanford (PTH) Physical Security prior to purchase and will be supplied by BH1. PTH Locksmiths shall key security padlocks to an individual construction key as well as to the Hanford Patrol and Hanford Fire Department Grand Master key system. When gates are open, security padlocks shall be locked in place to preclude unauthorized removal.

2.2 Key Control for Remote and Portable Equipment

2.2.1 Security Key Control

Security keys (e.g., padlock keys, crane battery shut-off box key, crane ignition key, etc.), when not in use, shall be stored in a lockable key box affixed to the wall within the BHI Construction Manager's office located in M0545. The Construction Manager and his lead shall be responsible for administration and control of access to the key box. A sign-in/sign-out log shall be in place for issuance and return of security keys. Lost keys shall be reported immediately to the BHI Construction Manager for disposition.

2.2.2 Crane Ignition Key and Battery Shut-Off Switch Lock Box

BHI Construction Management shall install a battery shut-off switch within the crane's electrical system to prevent unauthorized use. The battery shut-off switch shall be housed within a locked box securely attached to the crane's structure. The lock box key and ignition key, when not in use, shall be secured within the security key box located in the BM Construction Manager's office, M0545.

2.2.3 Portable Earth Moving Equipment

All portable earth-moving equipment (e.g., back-hoe, Caterpillar and like equipment) shall be moved away from the basin area when not in use. Ignition keys shall be stored in the security key box located in the BHI Construction Manager's office, M0545. Equipment requiring only a push-to-start button shall be placed outside of the basin perimeter fence when not in use.

2.3 Patrol Support

The Hanford Patrol shall provide random rover coverage of the basin area once per shift during off=shift hours, weekends, and holidays until all potential fissile material has been removed.

3.0 MATERIAL CONTROL AND ACCOUNTABILITY

Although no fuel fragments be found, a Material Balance Area (MBA) has been planned with corresponding protection features to cover the possibility that fragments might be discovered.

3.1 When Fuel is Found

In the event that a candidate fuel fragment is found, the MBA for Category IV material, with the security and accountability measures discussed herein, shall begin to provide protection for the item found. The fragment shall be transferred to the buried drum and the shield lid hoisted onto it. The area enclosed by the site security fence shall serve as the MBA boundary.

3.2 MBA Category

The attractiveness level for the F Reactor fuel is conservatively designated as `D'. At this attractiveness level, the material quantities still make the basin Category IV. This is because the safety and shipping limitation of 75 pounds would make the corresponding maximum amount of plutonium less than 0.1 kilogram, which is well below the 3.0-kilogram level needed to move the inventory to a higher category. The protection requirements are the same for IV-D and IV-E categories.

3.3 MBA Material Protection Summary

The MBA boundary will be the perimeter security fence. Personnel access within this area is restricted and controlled. The shielding lid on the holding drum would serve as a secondary level of containment corresponding to a locked lid. It weighs 200 to 400 pounds and the key to

the hoist that would be required to remove the lid is controlled. The lid will be removed from the buried drum only long enough to deposit the piece found, and then the crane will replace the lid. If the canister contains fuel at the end of the workday, but will not be moved into the truckmounted cask and covered, the canister top must be replaced and bolted down.

3.4 BM Personnel Responsibilities

BM shall assign a person to be responsible for monitoring activities in the basin during the transfer of material from the water-filled drum to the canister. Procedures shall delineate what activities and practices are acceptable for the basin with fuel present, so that the assigned person is prepared to identify any unauthorized or inappropriate activities and respond accordingly. Remote-controlled equipment in the basin shall only be accessible to authorized personnel.

3.5 Canister Loading Controls

When the accumulation of fuel is judged to be near the limit, a canister loading campaign will be initiated. Either a certified custodian assigned from K Basins shall oversee the accountability during the cleaning, weighing and packaging, or videos shall be made to document the fuel items as they are being cleaned and packaged. BHI shall have instructions to cover all of their excavating and loading activities. Instructions pertaining to the cleaning, weighing, and packaging of fuel found shall be approved by the Fluor Hanford (FH) Nuclear Material Custodian and by FH Safeguards.

3.6 Reportable Weight Values

The weights on each piece taken during the canister loading process will be used to establish quantities of reportable nuclear materials. BHI shall make up two working weight standards of approximately 10 and 20 pounds, which shall be weighed separately and together at the beginning and end of each day that the scales are used. The calibration of these standards shall be documented to demonstrate that the assigned values were determined using standards traceable by the National Bureau of Standards. Safeguards shall review and approve the standards, certification, and procedures. Safeguards will provide control limits for the weights of each standard.

3.7 Establishing Uranium Weights

Safeguards shall determine quantities of reportable materials by weighing the fuel fragments and multiplying the weight by a factor that represents the uranium component of the weight. It is anticipated that some of the fuel will be fragments with cladding, and some may be broken or complete pieces with end-caps in place. Two models have been associated with F Basin, model 03N was made from natural uranium and model 03E was made from 0.947%-enriched uranium. Safeguards will use 96% of the fuel weight to represent uranium weight. This was calculated from dimensional information and applies to both models of fuel. In the unlikely event that only full, intact pieces are found, an alternative would be to use the manufactured (factor weight) values and then weigh them to confirm that the applied values are correct.

3.8 Establishing Uranium Isotope Quantities

Irradiated F Basin fuel shall be presumed to be depleted uranium, since this is the most likely alternative. The predominant loading was natural uranium with tube ends of 0.947%-enriched fuel. End pieces usually constitute no more than one fourth of the loaded tube. Fuel made with natural uranium becomes depleted uranium during irradiation, and the 0.947%-enriched fuel may still be enriched, but may be depleted as well. For comparison, the 0.947%-enriched fuel in the K-East Basin is now about half-depleted uranium. Since the 03N (natural) fuel outnumbered the 03E fuel by 3-to-1, the resulting ratio of depleted-to-enriched would be an even higher ratio; as much as 6-to-1. Safeguards shall use the uranium isotopic of 0.50%, which is the K-East Basin average for natural uranium fuel, whereas older records identify natural uranium models for 125 canisters.

3.9 **Establishing Neptunium and Plutonium Quantities**

Safeguards shall use 0.19% as the plutonium concentration in the fuel. This is based on the current K-East Basin's average, which is more representative of the F Basin's than the K-West Basin's (where most of the fuel is Mark IA). Neptunium shall be 0.003%, based on the same source. The value of 94% shall be used for the plutonium isotopic percentage. This is not based on any current fuel inventory, but, instead, on the fact that the production criteria for weaponsgrade fuel was 6% plutonium 240.

3.10 Transfer Documentation

The transfer of fuel fragments from the F Reactor to the 100-K Area shall be documented on the Safeguards Nuclear Material Item Transfer form as a transfer between two MBAs under the same Reporting Identification Symbol.

3.11 Transfer Receipt

Once the shipment arrives at the designated 100-K Basin, the Nuclear Material Custodian shall conduct a transfer check; which shall include a visual inspection of the cask and the TID. The cask shall be opened, the number and the identification of the canister shall be verified, and then the canister shall be transferred to the basin.